

CLAIMS

1. An opening/closing apparatus for an equipment case comprising a first case, a hinge apparatus having a hinge main body whose one end part is turnably connected to said first case about a first turning axis, and a second case turnably connected to the other end part of said hinge main body about a second turning axis parallel to said first turning axis, said hinge main body being turned with respect to said first case and said second case being turned with respect to said hinge main body thereby said second case being turnable with respect to said first case between a folding position and a developing position,

wherein between said first case and said hinge main body, there are provided a first stop means adapted to stop said hinge main body in a predetermined initial position when said hinge main body is turned to said predetermined initial position in one direction so that said second case is turned toward said folding position from said developing position, a second stop means adapted to stop said hinge main body in a predetermined terminal position when said hinge main body is turned to said predetermined terminal position in the other direction so that said second case is turned toward said developing position from said folding position, a first turn prohibition means adapted to prohibit said hinge main body from turning in the other direction from said initial position with a predetermined force, and a second turn prohibition means adapted to prohibit said hinge main body from turning in said one direction from said terminal position with a predetermined force,

between said second case and said hinge main body, there are provided a third stop means adapted to stop said second case in a predetermined intermediate position when said second case is turned to said predetermined intermediate position on the way toward said folding position from said developing position in an opening direction with respect to said hinge main body, a third turn prohibition means adapted to prohibit said second case from turning in said opening direction from said folding position with a predetermined force, and a fourth turn prohibition means adapted to prohibit said second

case from turning toward said folding position from said intermediate position in a closing direction with a predetermined force, and

said prohibiting force of said first turn prohibition means is set to be larger than said prohibiting force of said third turn prohibition means, and said prohibiting force of said fourth turn prohibition means is set to be larger than said prohibiting force of said second turn prohibition means.

2. An opening/closing apparatus for an equipment case according to claim 1, wherein said first turn prohibition means is a first turn biasing means adapted to turn bias said hinge main body in said one direction when said hinge main body is located in said initial position, said second turn prohibition means is a second turn biasing means adapted to turn bias said hinge main body in said the other direction when said hinge main body is located in said terminal position, said third turn prohibition means is a third turn biasing means adapted to turn bias said second case in said closing direction when said second case is located in said folding position, and said fourth prohibition means is a fourth turn biasing means adapted to turn bias said second case in said opening direction when said second case is located in said intermediate position.

3. An opening/closing apparatus for an equipment case according to claim 2, wherein said hinge apparatus includes a first hinge for turnably connecting said first case and one end part of said hinge main body together about said first turning axis, and a second hinge for turnably connecting said second case and the other end part of said hinge main body together about said second turning axis,

said first hinge includes a first movable member disposed at one of said first case and said hinge main body such that said first movable member is non-turnable but movable in the direction of said first turning axis, and a first biasing means adapted to bias said first movable member toward said the other of said first case and said hinge main body,

between confronting surfaces of said first movable member and said the other of said first case and said hinge main body, there are provided a first conversion means adapted to convert the biasing force of said first biasing means acting on said first movable member when said hinge main body is located in said initial position, into a turn biasing force for turn biasing said hinge main body in said one direction, and a second conversion means adapted to convert the biasing force of said first biasing means acting on said first movable member when said hinge main body is located in said terminal position, into a turn biasing force for turn biasing said hinge main body in said the other direction,

said first turn biasing means is constituted by said first biasing means and said first conversion means, and said second turn biasing means is constituted by said first biasing means and said second conversion means,

said second hinge includes a second movable member disposed at one of said second case and said hinge main body such that said second movable member is non-turnable but movable in the direction of said second turning axis, and a second biasing means adapted to bias said second movable member toward said the other of said second case and said hinge main body,

between confronting surfaces of said second movable member and said the other of said second case and said hinge main body, there are provided a third conversion means adapted to convert the biasing force of said second biasing means acting on said second movable member when said second case located in said folding position, into a turn biasing force for turn biasing said second case in said closing direction, and a fourth conversion means adapted to convert the biasing force of said second biasing means acting on said second movable member when said second case is located in said intermediate position, into a turn biasing force for turn biasing said second case in said opening direction, and

said third turn biasing means is constituted by said second biasing means and said third conversion means, and said fourth turn biasing means is constituted by said second biasing means and said fourth conversion means.

4. An opening/closing apparatus for an equipment case according to one of claims 1 through 3, wherein said folding position is restricted by abutment of said second case with said first case.

5. An opening/closing apparatus for an equipment case according to one of claims 1 through 4, wherein said intermediate position is defined such that when said second case is located in said intermediate position, said second case is located on a line orthogonal to said first and second turning axes.

6. A two-axis hinge apparatus comprising a hinge main body, a first hinge disposed on said hinge main body with an axis thereof aligned with a first turning axis, and a second hinge disposed on said hinge main body with an axis thereof aligned with a second turning axis parallel to said first turning axis,

wherein said first hinge includes a first fixing member non-turnably disposed on said hinge main body and a first turnable member connected to said first fixing member such that said first turnable member is turnable between a first initial position and a first turning position, between said first fixing member and said first turnable member, there are provided a first turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first turning position from said first initial position with a predetermined force, a second turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first initial position from said first turning position with a predetermined force, and a first stop means which is adapted to stop said first turnable member, which would otherwise be turned toward said first initial position from said first turning position, in said first initial position with a predetermined force,

said second hinge includes a second fixing member non-turnably disposed on said hinge main body and a second turnable member connected to said second fixing member such that said second turnable member is turnable between a second initial position and a second turning position, between said second fixing member and said second turnable member, there are provided a third turn prohibition means which is adapted to prohibit

said second turnable member from turning toward said second turning position from said second initial position with a predetermined force, a fourth turn prohibition means which is adapted to prohibit said second turnable member from turning toward said second initial position from said second turning position with a predetermined force, and a fourth stop means which is adapted to stop said second turnable member, which would otherwise be turned toward said second initial position from said second turning position, in said second turning position with a predetermined force,

said turning direction toward said first turning position from said first initial position and said turning direction toward said second turning position from said second initial position are set to be same in direction,

said turn prohibiting force of said first turn prohibition means is set to be larger than said turn prohibiting force of said third turn prohibition means,

said stopping force of said fourth stop means is set to be larger than said turn prohibiting force of said first turn prohibition means,

said turn prohibiting force of said fourth turn prohibition means is set to be larger than said turn prohibiting force of said second turn prohibition means, and

said stopping force of said first stop means is set to be larger than said turn prohibiting force of said fourth turn prohibition means.

7. A two-axis hinge apparatus according to claim 6, wherein said first hinge further includes a first movable member disposed between said first fixing member and said first turnable member and connected to said first fixing member such that said first movable member is non-turnable but movable in the direction of said first turning axis, and a first biasing means adapted to bias said first movable member toward said first turnable member along said first turning axis,

between confronting surfaces of said first turnable member and said first movable member, there are provided a first conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first initial position, into a turn biasing force for turn biasing

said first turnable member toward said first initial position from said first turnable position, a second conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first turnable position, into a turn biasing force for turn biasing said first turnable member toward said first turnable position from said first initial position, and said first stop means,

said first turn prohibition means is constituted by said first conversion means and said first biasing means, and said second turn prohibition means is constituted by said second conversion means and said first biasing means, and said first turnable member, which is turn biased by said first conversion means, is stopped in said first initial position by said first stop means,

said second hinge further includes a second movable member disposed between said second fixing member and said second turnable member and connected to said second fixing member such that said second movable member is non-turnable but movable in the direction of said second turning axis, and a second biasing means adapted to bias said second movable member toward said second turnable member along said second turning axis,

between confronting surfaces of said second turnable member and said second movable member, there are provided a third conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second initial position, into a turn biasing force for turn biasing said second turnable member toward said second initial position from said second turning position, a fourth conversion means adapted to convert a turn biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second turning position, into a turn biasing force for turn biasing said second turnable member toward said second turning position from said second initial position, and said fourth stop means,

said third turn prohibition means is constituted by said third conversion means and said second biasing means, said fourth turn prohibition means is constituted by said

fourth conversion means and said second biasing means, and said second turnable member, which is turn biased by said fourth conversion means, is stopped in said second turnable position by said fourth stop means.

8. A two-axis hinge apparatus comprising a hinge main body, a first hinge disposed on said hinge main body with an axis thereof aligned with a first turning axis, and a second hinge disposed on said hinge main body with an axis thereof aligned with a second turning axis parallel to said first turning axis, wherein

said first hinge includes a first fixing member non-turnably disposed on said hinge main body and a first turnable member connected to said first fixing member such that said first turnable member is turnable between a first initial position and a first turning position, between said first fixing member and said first turnable member, there are provided a first turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first turning position from said first initial position with a predetermined force, a second turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first initial position from said first turning position with a predetermined force, a first stop means which is adapted to stop said first turnable member in said first initial position on the way toward said first initial position from said first turning position with a predetermined force, and a second stop means which is adapted to stop said first turnable member in said first turning position on the way toward said first turning position from said first initial position with a predetermined force,

said second hinge includes a second fixing member non turnably disposed on said hinge main body and a second turnable member connected to said second fixing member such that said second turnable member is turnable between a second initial position and a second turning position, between said second fixing means and said second turnable member, there are provided a third turn prohibition means which is adapted to prohibit said second turnable member from turning toward said second turning position from said second initial position with a predetermined force, and a fourth turn prohibition means

which is adapted to prohibit said second turnable member from turning toward said second initial position from said second turning position with a predetermined force,

said turning direction toward said first turning position from said first initial position and said turning direction toward said second turning position from said second initial position are set to be same in direction,

said turn prohibiting force of said first turn prohibition means is set to be smaller than said turn prohibiting force of said third turn prohibition means,

said stopping force of said second stop means is set to be larger than said turn prohibiting force of said third turn prohibition means,

said turn prohibiting force of said fourth turn prohibition means is set to be larger than said turn prohibiting force of said second turn prohibition means, and

said stopping force of said first stop means is set to be larger than said turn prohibiting force of said fourth turn prohibition means.

9. A two-axis hinge apparatus according to claim 8, wherein said first hinge further includes a first movable member disposed between said first fixing member and said first turnable member and connected to said first fixing member such that said first movable member is non-turnable but movable in the direction of said first turning axis, and a first biasing means adapted to bias said first movable member toward said first turnable member along said first turning axis,

between confronting surfaces of said first turnable member and said first movable member, there are provided a first conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first initial position, into a turn biasing force for turn biasing said first turnable member toward said first initial position from said first turning position, a second conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first turning position, into a turn biasing force for turn biasing said first turnable member

toward said first turning position from said first initial position, said first stop means and said first stop means,

said first turn prohibition means is constituted by said first conversion means and said first biasing means, said second turn prohibition means is constituted by said second conversion means and said first biasing means, said first turnable member, which is turn biased by said first conversion means, is stopped in said first initial position by said first stop means, and said first turnable member, which is turn biased by said second conversion means, is stopped in said first turning position by said second stop means,

said second hinge further includes a second movable member disposed between said second fixing member and said second turnable member and connected to said second fixing member such that said second movable member is non turnable but movable in the direction of said second turning axis, and a second biasing means adapted to bias said second movable member toward said second turnable member along said second turning axis,

between confronting surfaces of said second turnable member and said second movable member, there are provided a third conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second initial position, into a turn biasing force for turn biasing said second turnable member toward said second initial position from said second turning position, and a fourth conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second turning position, into a turn biasing force for turn biasing said second turnable member toward said second turning position from said second initial position,

said third turn prohibition means is constituted by said third conversion means and said second biasing means, and said fourth turn prohibition means is constituted by said fourth conversion means and said second biasing means.

10. A two-axis hinge apparatus comprising a hinge main body, a first hinge disposed on said hinge main body with an axis thereof aligned with a first turning axis, and a second hinge disposed on said hinge main body with an axis thereof aligned with a second turning axis parallel to said first turning axis, wherein

said first hinge includes a first fixing member non-turnably disposed on said hinge main body and a first turnable member connected to said first fixing member such that said first turnable member is turnable between said first initial position and said first turning position, between said first fixing member and said first turnable member, there are provided a first turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first turning position from said first initial position with a predetermined force and a second turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first initial position from said first turning position with a predetermined force,

said second hinge includes a second fixing member non-turnably disposed on said hinge main body and a second turnable member connected to said second fixing member such that said second turnable member is turnable between said second initial position and said second turning position, between said second fixing member and said second turnable member, there are provided a third turn prohibition means which is adapted to prohibit said second turnable member from turning toward said second turning position from said second initial position with a predetermined force, a fourth turn prohibition means which is adapted to prohibit said second turnable member from turning toward said second initial position from said second turning position with a predetermined force, a third stop means which is adapted to stop said second turnable member in said second initial position on the way toward said second initial position from said second turning position with a predetermined force, and a fourth stop means being adapted to stop said second turnable member in said second turning position on the way toward said second turning position from said second initial position with a predetermined force,

said turning direction toward said first turning position from said first initial position and said turning direction toward said second turning position from said second initial position are set to be same in direction,

said turn prohibiting force of said first turn prohibition means is set to be larger than said turn prohibiting force of said third turn prohibition means,

said stopping force of said fourth stop means is set to be larger than said turn prohibiting force of said first turn prohibition means,

said turn prohibiting force of said second turn prohibition means is set to be larger than said turn prohibiting force of said fourth turn prohibition means, and

said turn prohibiting force of said second turn prohibition means is set to be smaller than the stopping force of said third stop means.

11. A two-axis hinge apparatus according to claim 10, wherein said first fixing member further includes a first movable member disposed between said first fixing member and said first turnable member and connected to said first fixing member such that said first movable member is non-turnable but movable in the direction of said first turning axis, and a first biasing member adapted to bias said first movable member toward said first turnable member along said first turning axis,

between confronting surfaces of said first turnable member and said first movable member, there are provided a first conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first initial position, into a turn biasing force for turn biasing said first turnable member toward said first initial position from said first turning position, and a second conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first movable member is located in said first turning position, into a turn biasing force for turn biasing said first turnable member toward said first turning position from said first initial position,

said first turn prohibition means is constituted by said first conversion means and said first biasing means, and said second turn prohibition means is constituted by said second conversion means and said first biasing means,

said second hinge further includes a second movable member disposed between said second fixing member and said second turnable member and connected to said second fixing member such that said second movable member is non-turnable but movable in the direction of said second turning axis, and a second biasing means adapted to bias said second movable member toward said second turnable member along said second turning axis,

between confronting surfaces of said second turnable member and said second movable member, there are provided a third conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second movable member is located in said second initial position, into a turn biasing force for turn biasing said second turnable member toward said second initial position from said second turning position; a fourth conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second turning position, into a turn biasing force for turn biasing said second turnable member toward said second turning position from said second initial position, a third stop means and a fourth stop means,

said third turn prohibition means is constituted by said third conversion means and said second biasing means, said fourth turn prohibition means is constituted by said fourth conversion means and said second biasing means, said turnable member, which is turn biased by said third conversion means, is stopped in said second initial position by said third stop means, and said second turnable member, which is turn biased by said fourth conversion means, is stopped in said second turning position by said fourth stop means.

12. A two-axis hinge apparatus comprising a hinge main body, a first hinge disposed on said hinge main body with an axis thereof aligned with a first turning axis, and a

second hinge disposed on said hinge main body with an axis thereof aligned with a second turning axis parallel to said first turning axis, wherein

said first hinge includes a first fixing member non-turnably disposed on said hinge main body and a first turnable member connected to said first fixing member such that said first turnable member is turnable between a first initial position and a first turning position, between said first fixing member and said first turnable member, there are provided a first turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first turning position from said first initial position with a predetermined force, a second turn prohibition means which is adapted to prohibit said first turnable member from turning toward said first initial position from said first turning position with a predetermined force, and a second stop means which is adapted to stop said first turnable member in said first turning position on the way toward said first turning position from said first initial position with a predetermined force,

said second hinge includes a second fixing member non-turnably disposed on said hinge main body and a second turnable member connected to said second fixing member such that said second turnable member is turnable between a second initial position and a second turning position, between said second fixing member and said second turnable member, there are provided a third turn prohibition means which is adapted to prohibit said second turnable member from turning toward said second turning position from said second initial position with a predetermined force, a fourth turn prohibition means which is adapted to prohibit said second turnable member from turning toward said second initial position from said second turning position with a predetermined force, and a third stop means which is adapted to stop said second turnable member, which would otherwise be turned toward said second initial position from said second turning position, in said second initial position with a predetermined force,

said turning direction toward said first turning position from said first initial position and said turning direction toward said second turning position from said second initial position are set to be same in direction,

said turn prohibiting force of said first turn prohibition means is set to be smaller than said turn prohibiting force of said third turn prohibition means,

said stopping force of said second stop means is set to be larger than said turn prohibiting force of said third turn prohibition means,

said turn prohibiting force of said second turn prohibition means is set to be larger than said turn prohibiting force of said fourth turn prohibition means, and

said turn prohibiting force of said second turn prohibition means is set to be smaller than said stopping force of said second stop means.

13. A two-axis hinge apparatus according to claim 12, wherein said first hinge further includes a first movable member disposed between said first fixing member and said first turnable member and connected to said first fixing member such that said first movable member is non-turnable but movable in the direction of said first turning axis, and a first biasing means adapted to bias said first movable member toward said first turnable member along said first turning axis,

between confronting surfaces of said first turnable member and said first movable member, there are provided a first conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first initial position, into a turn biasing force for turn biasing said first turnable member toward said first initial position from said first turning position, a second conversion means adapted to convert a biasing force of said first biasing means acting on said first movable member when said first turnable member is located in said first turning position, into a turn biasing force for turn biasing said first turnable member toward said first turning position from said first initial position, and said second stop means,

said first turn prohibition means is constituted by said first conversion means and said first biasing means, said second turn prohibition means is constituted by said second conversion means and said first biasing means, and said first turnable member, which is

turn biased by said second conversion means, is stopped in said first turning position by said second stop means,

said second hinge further includes a second movable member disposed between said second fixing member and said second turnable member and connected to said second fixing member such that said second movable member is non-turnable but movable in the direction of said second turning axis, and a second biasing means adapted to bias said second movable member towards said second turnable member along said second turning axis,

between confronting surfaces of said second turnable member and said second movable member, there are provided a third conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second initial position, into a turn biasing force for turn biasing said second turnable member toward said second initial position from said second turning position, a fourth conversion means adapted to convert a biasing force of said second biasing means acting on said second movable member when said second turnable member is located in said second turning position, into a turn biasing force for turn biasing said second turnable member toward said second turning position from said second initial position, and said third stop means, and

said third turn prohibition means is constituted by said third conversion means and said second biasing means, said fourth turn prohibition means is constituted by said fourth conversion means and said second biasing means, and said second turnable member, which is turn biased by said third conversion means, is stopped in said second initial position by said third stop means.